SECOND MIDTERM SOLUTION

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QUESTION NO 1

1) THE RELATION ALGEBRA EXPRESSIONS

1)

- $R1 = \pi_{number}\left(\sigma_{faculty='engineering'} COURSES\right)$
- $R2 = \pi_{student,Date}(R1 \bowtie_{number=course} EXAMS)$
- $R3 = R2 - \pi_{student,d1}\left(\sigma_{d1>Date}\left(R2 \times \rho_{s1,d1\leftarrow student,Date}(R2)\right)\right)$
- $\pi_{number\ ,surname,\ firstname}\ (R3\ \bowtie_{student=number}\ STUDENTS)$

2)

- $R1 = \pi_{student}\left(\pi_{Student,Course}(STUDYPLAN) - \pi_{Students,Course}(EXAMS)\right)$
- $R2 = \pi_{student}(STUDYPLAN) - R1$
- $\pi_{number\ ,surname,\ firstname}(R2 \bowtie_{student=number} STUDENTS)$

3)

- $R1 = \pi_{number}\left(\sigma_{faculty='literature'}(COURESES)\right)$
- $R2 = \pi_{student\ ,grade}(R1\ \bowtie_{number=course}\ (EXAMS))$
- $R3 = \pi_{s1,grade}\left(\sigma_{g1>grade}\left(R2\ \times \rho_{s1,g1\leftarrow student\ ,grade}(R2)\right)\right)$
- $R4 = \pi_{student}\left(R2\ - \rho_{student,grade\leftarrow s1,grade}(R3)\right)$
- $\pi_{number\ ,surname,\ firstname}(R4\ \bowtie_{student=Number}\ STUDENTS)$

- For more details about max function by relational algebra read more here : http://stackoverflow.com/questions/4952451/aggregate-relational-algebra-maximum

4)

- $R1 = \rho_{f \leftarrow faculty}\left(\pi_{student,faculty}(COURSES \bowtie_{number=course} STUDYPLAN)\right)$
- $R2 = \pi_{student}\left(\sigma_{f<>faculty}(STUDENTS \bowtie_{number=student} R1)\right)$
- $R3 = \pi_{student}(R1) - R2$
- $\pi_{number\ ,surname,\ firstname}(STUDENTS \bowtie_{number=student} R3)$

5)

- $R1 = \rho_{tn,tsurname \leftarrow number,surname}(\pi_{number,surname}(TUTORS))$
- $R2 = \pi_{Number,tsurname}\left(R1 \bowtie_{tnum=Tutor} (COURSES)\right)$
- $R3 = \pi_{student,tsurname}(R2 \bowtie_{Number=Course} EXAMS)$
- $\pi_{firstname\ ,surname}(\sigma_{surname=tsurname}(STUDENTS \bowtie_{number=student} R3))$

2) SQL STATEMENTS

1)

```
Create view VW --used bellow and pls consider the view as a table
AS
Select e.Student , [date]
from COURSES c
join EXAMS e
on c.Number = e.Course
• Where c.Faculty = 'engineering'
-- the answer
select s.Number , s.Surname , s.Firstname
from STUDENTS as s
join VW as e
on s.Number = e.Student
Where [date] in (select MAX([date]) from VW)
```

2)

```
select st.Number , st.Surname , st.Firstname
from STUDENTS as st
where number not in
(select t.Student from
(
select Student , Course from STUDYPLAN
EXCEPT
select Student , Course from EXAMS
)AS t)
```

3)

```
create view VW2 --used bellow and pls consider the view as a table
AS
select Student , Grade
from EXAMS e
join COURSES c
on e.Course = c.Number
• where c.Faculty = 'literature'
-- the answer
select st.Number , st.Surname , st.Firstname
from STUDENTS st
join VW2 r
on st.Number = r.Student
where r.Grade in (select MAX(Grade) from VW2)
```

4)

```
select Number , Surname , Firstname
from STUDENTS
Where Number in (
      select student from STUDYPLAN
      EXCEPT
      select sp.student
      from STUDENTS st
      join COURSES c
      join STUDYPLAN sp
      on sp.Course = c.Number
      on sp.Student = st.Number
      where c.Faculty <> st.Faculty
)
```

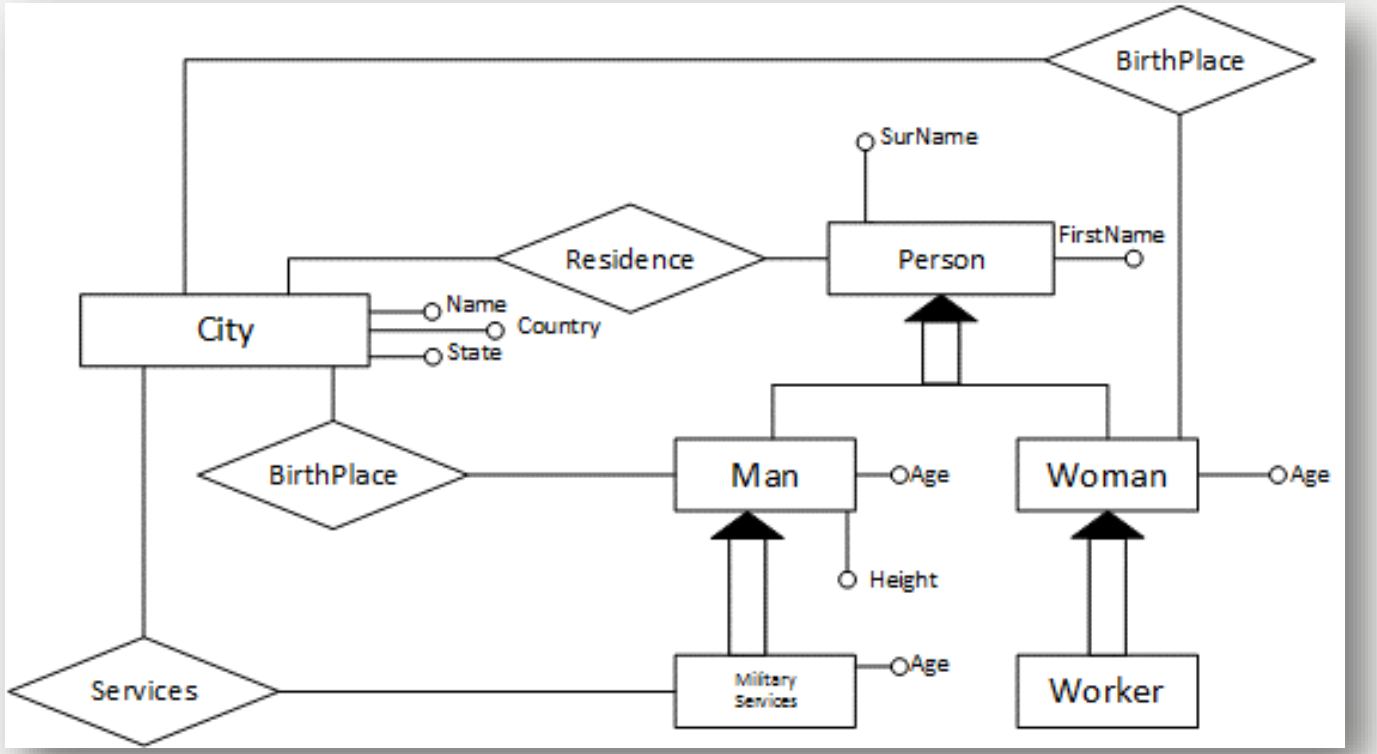
5)

```
select st.Firstname , st.Surname
from STUDENTS st
join EXAMS ex
join COURSES c
join TUTORS t
on t.Number = c.Tutor
on c.Number = ex.Course
on ex.Student = st.Number
WHERE t.Surname = st.Surname
```

QUESTION NO 2

1) E-R SCHEMA MODIFYING

WITHOUT MODIFICATION

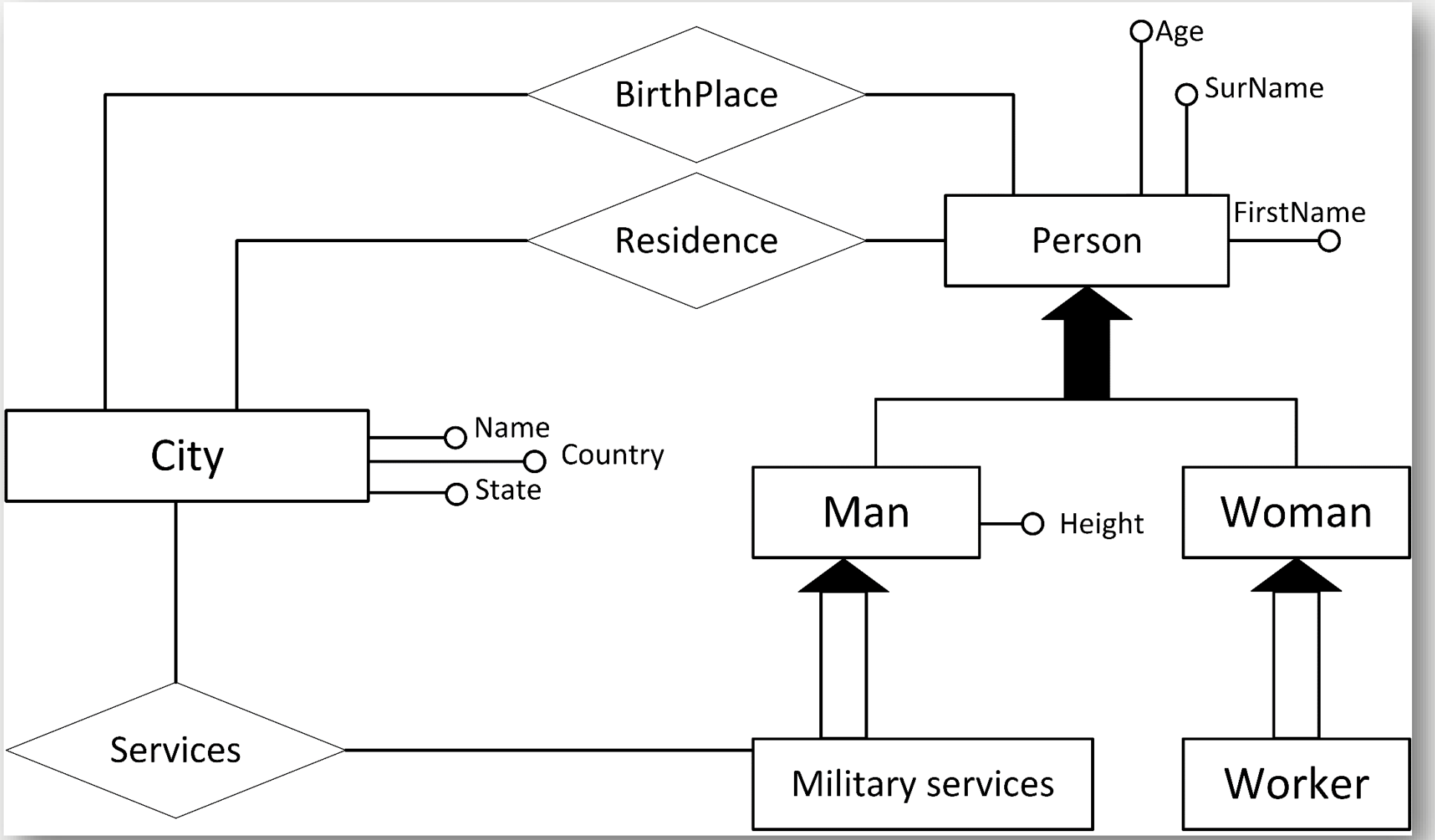


NOTES :

1) Man & Woman generalization should be a total generalization
2) "Age" should be in Person Entity
3) "BirthPlace" should be a relationship between City and Person

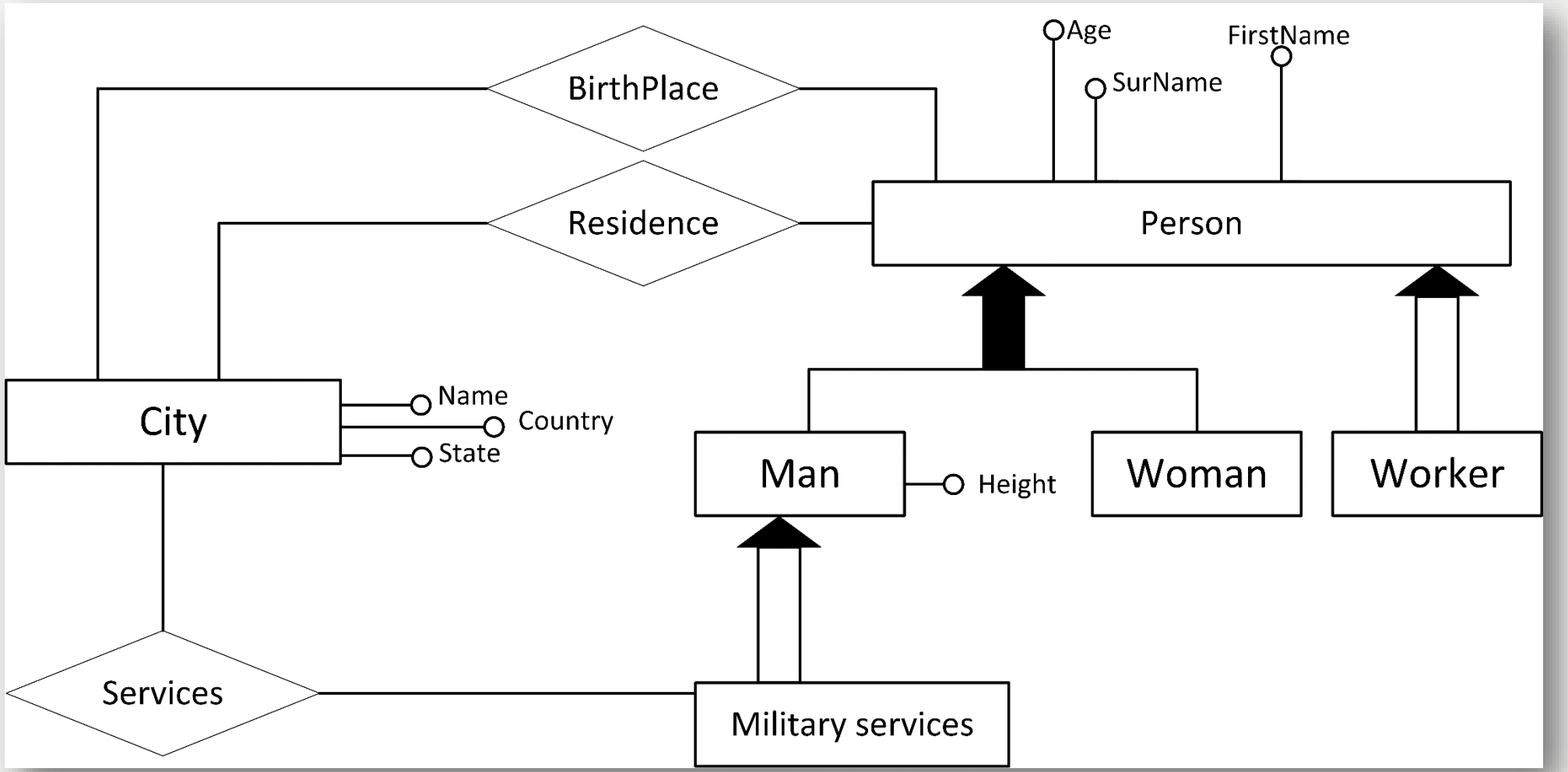
NOTE THAT THE MODIFICATIONS OF THIS QUESTION ARE CUMULATIVE

A) AFTER MODIFICATION



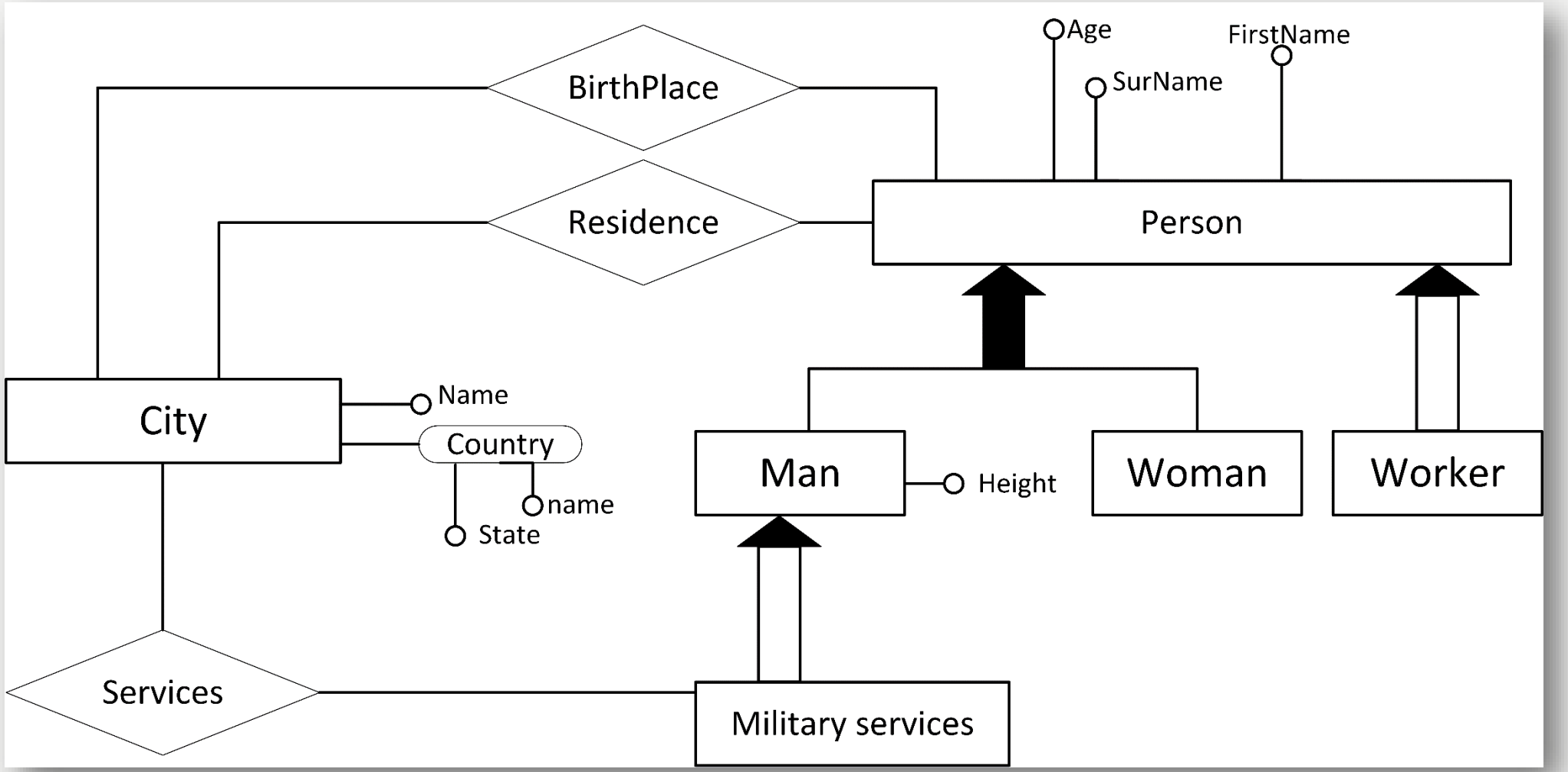
B)

- WHEN THE MAN AND WOMEN CAN BE WORKERS THEN PERSON CAN BE A WORKER



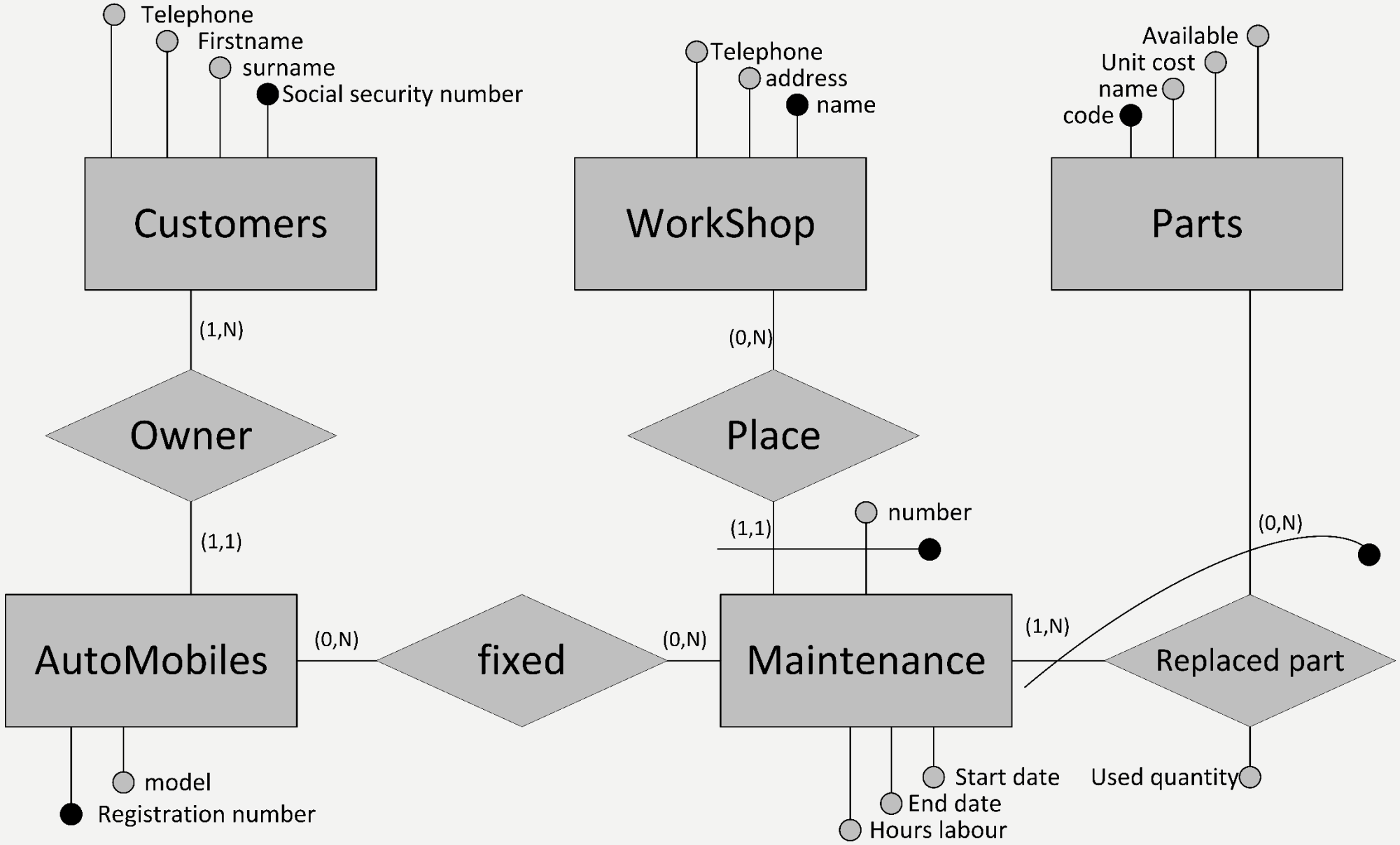
C)

- ADD A COMPOSITE ATTRIBUTE NAMED "COUNTRY" WITH SUB_ATTRIBUTE (NAME , STATE)



2) DEFINE A NEW E-R SCHEMA

THE NEW E-R SCHEMA AS DESCRIBED



THANK YOU

BEST WISHES